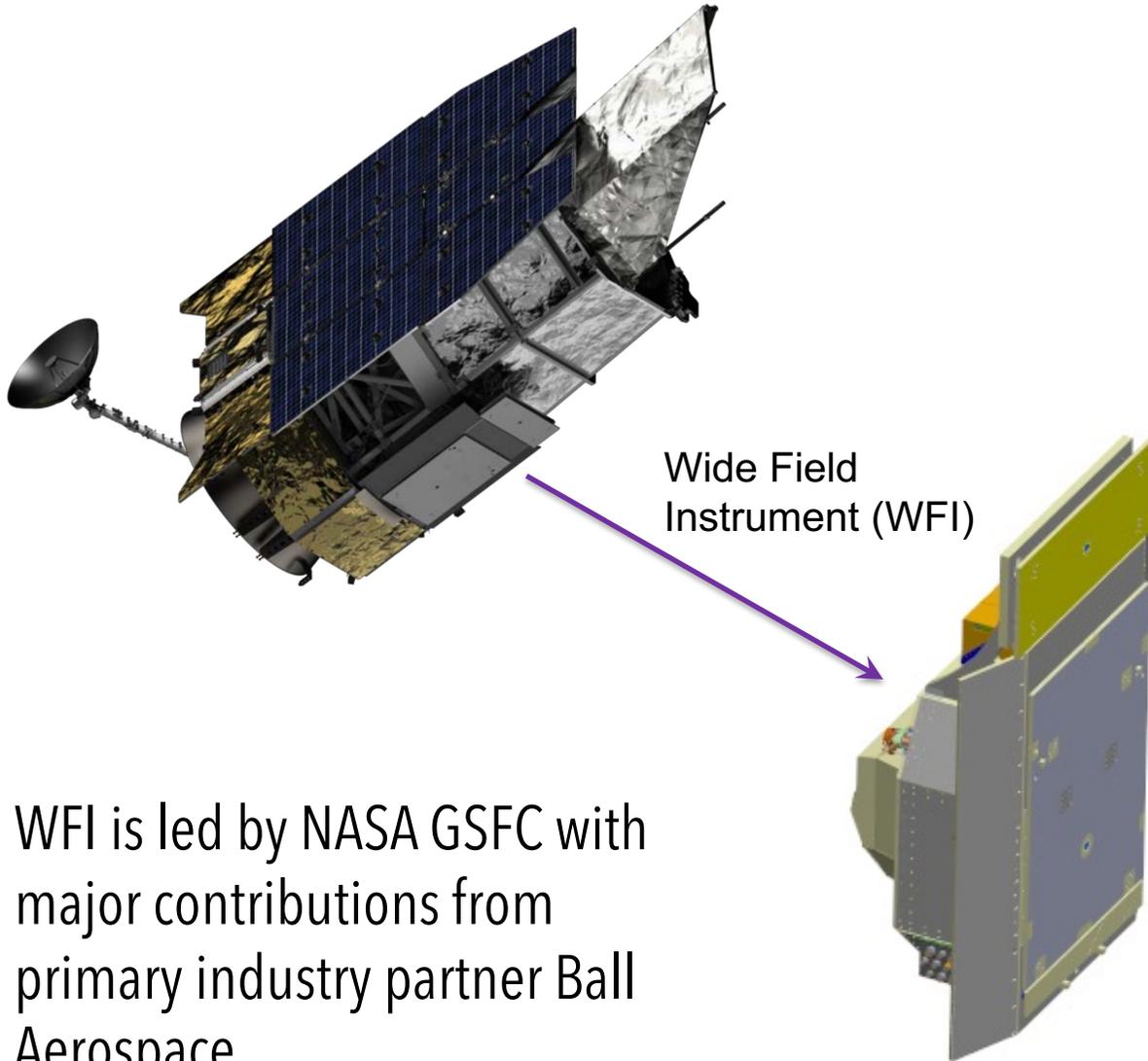


THE NANCY GRACE ROMAN SPACE TELESCOPE

Wide Field Instrument Status



Joshua Schlieder
WFI Scientist – NASA GSFC
Roman Community Forum
September 14th 2022



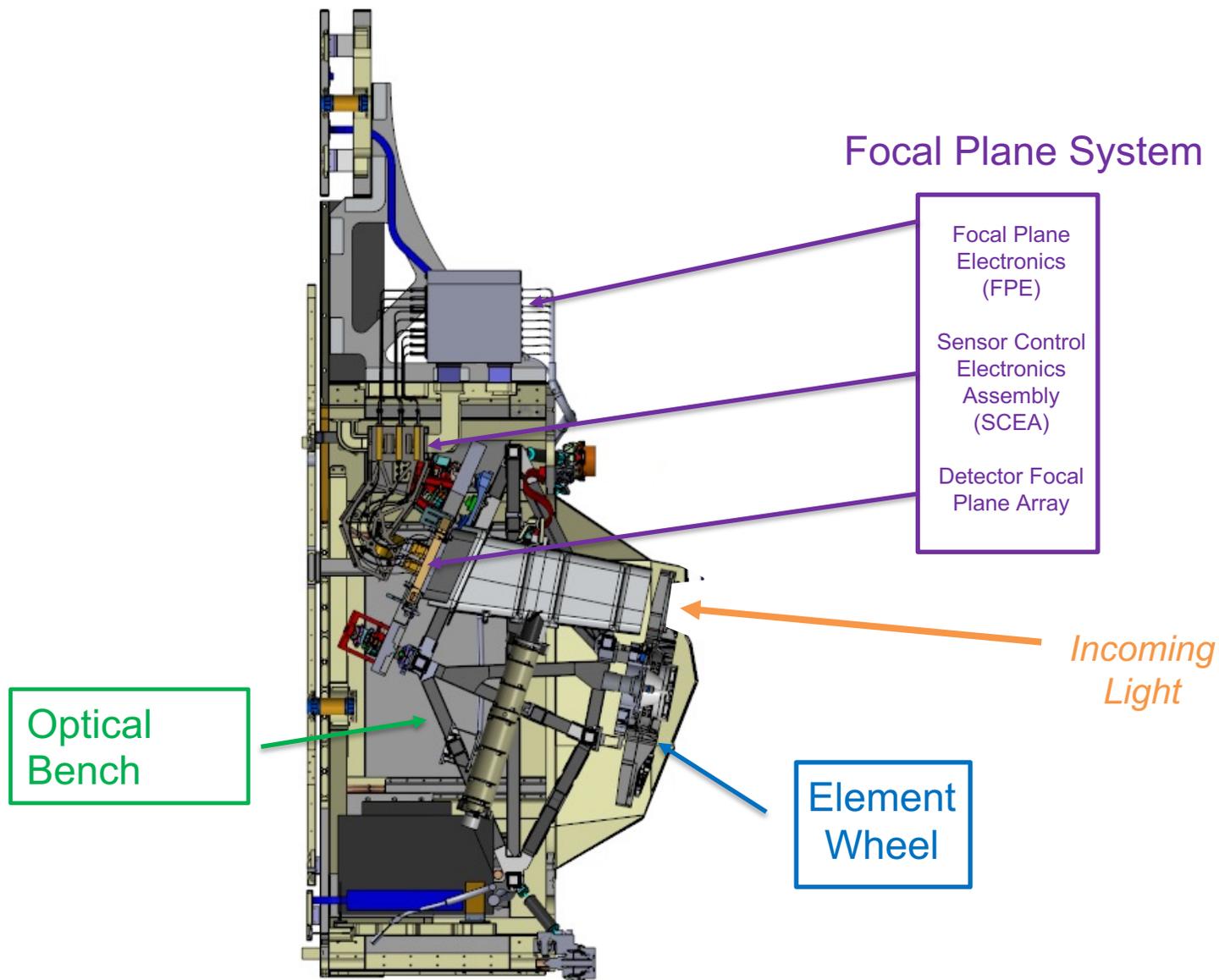
WFI is led by NASA GSFC with major contributions from primary industry partner Ball Aerospace

Instrument Overview

- Focal plane array of 18 Teledyne 4k × 4k detectors
 - Large field-of-view (FOV) – 0.8 x 0.4 deg (0.281 deg², excluding gaps)
 - Spatial sampling: 0.11 arcsec/pixel
 - Image stability: 1.0 nm RMS wave front error (WFE) variation in 180 sec
 - Guide star sensing interleaved with science data collection
- Element wheel enables imaging and spectroscopy spanning 0.48 to 2.3 μm
 - 8 imaging filters
 - Prism and grism for full-field, slitless spectroscopy
 - Blank position for darks, flat fields, and other calibrations
- Internal relative calibration system
- Instrument is passively cooled

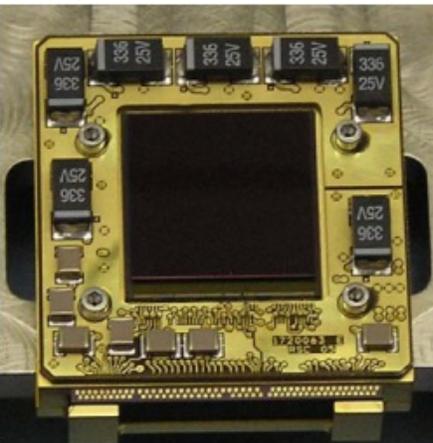
https://roman.gsfc.nasa.gov/science/WFI_technical.html

Wide Field Instrument – Key Subsystem Overview



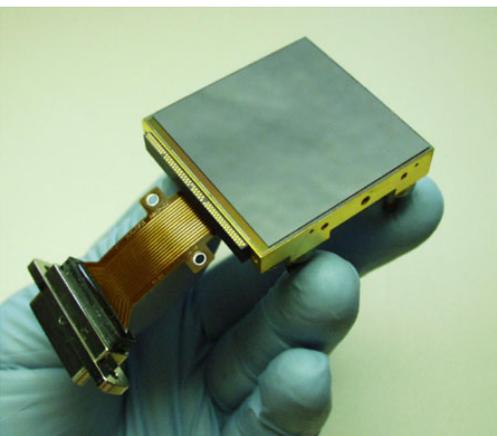
H1R (Hubble WFC3 IR)

- 1024 x 1024 pixels
- 18 μm pixels
- QE ~ 90% (1.0 – 1.7 μm)
- Dark current <0.05 e-/s/pix
- Noise – 12 e- RMS (16 reads)
- Development: 2000 - 2007



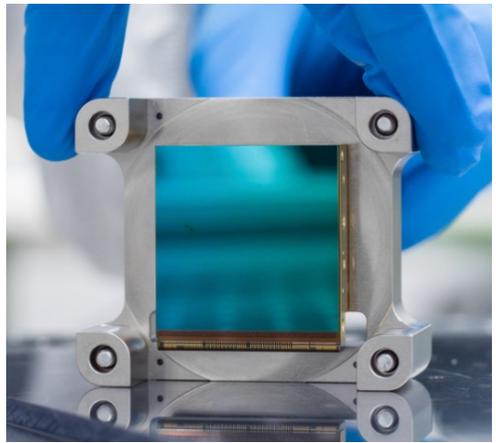
H2RG (JWST, Euclid)

- 2048 x 2048 pixels
- 18 μm pixels
- QE ~ 90% (@2 μm)
- Dark current <0.01 e-/s/pix
- Noise – 6e- RMS (1000 s)
- Development: 2002-2014



H4RG - 10 (Roman WFI)

- 4096 x 4096 pixels
- 10 μm pixels
- QE ~ 90 % (0.8 – 2.1 μm)
- Dark current <0.005 e-/s/pix
- Noise – 5 - 6 e- RMS (180 s)
- Development: 2011-2021



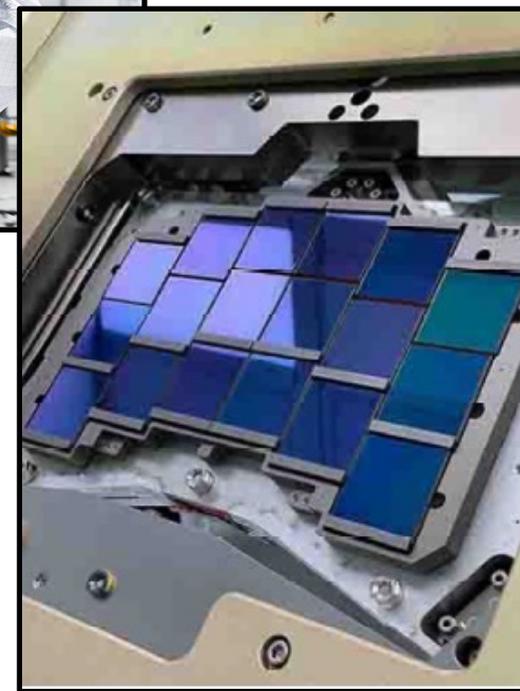
Roman detector development was a decade long program with key early investments, dozens of detectors fabricated and screened, then characterized and tested at GSFC. Detectors that passed flight acceptance testing exceed performance requirements and program exceeded requirement on detector yield.

Detectors and Focal Plane Array

- 18 flight detectors and 6 spares selected and prioritized from 28 that passed acceptance testing
- Flight detectors integrated and aligned into focal plane at NASA GSFC, undergoing assembly characterization
- Flight control electronics undergoing component test and assembly integration
- ETU focal plane system (detector array + readout and control electronics) has cleared vibration and electrical interference tests and completed a thermal and performance test campaign

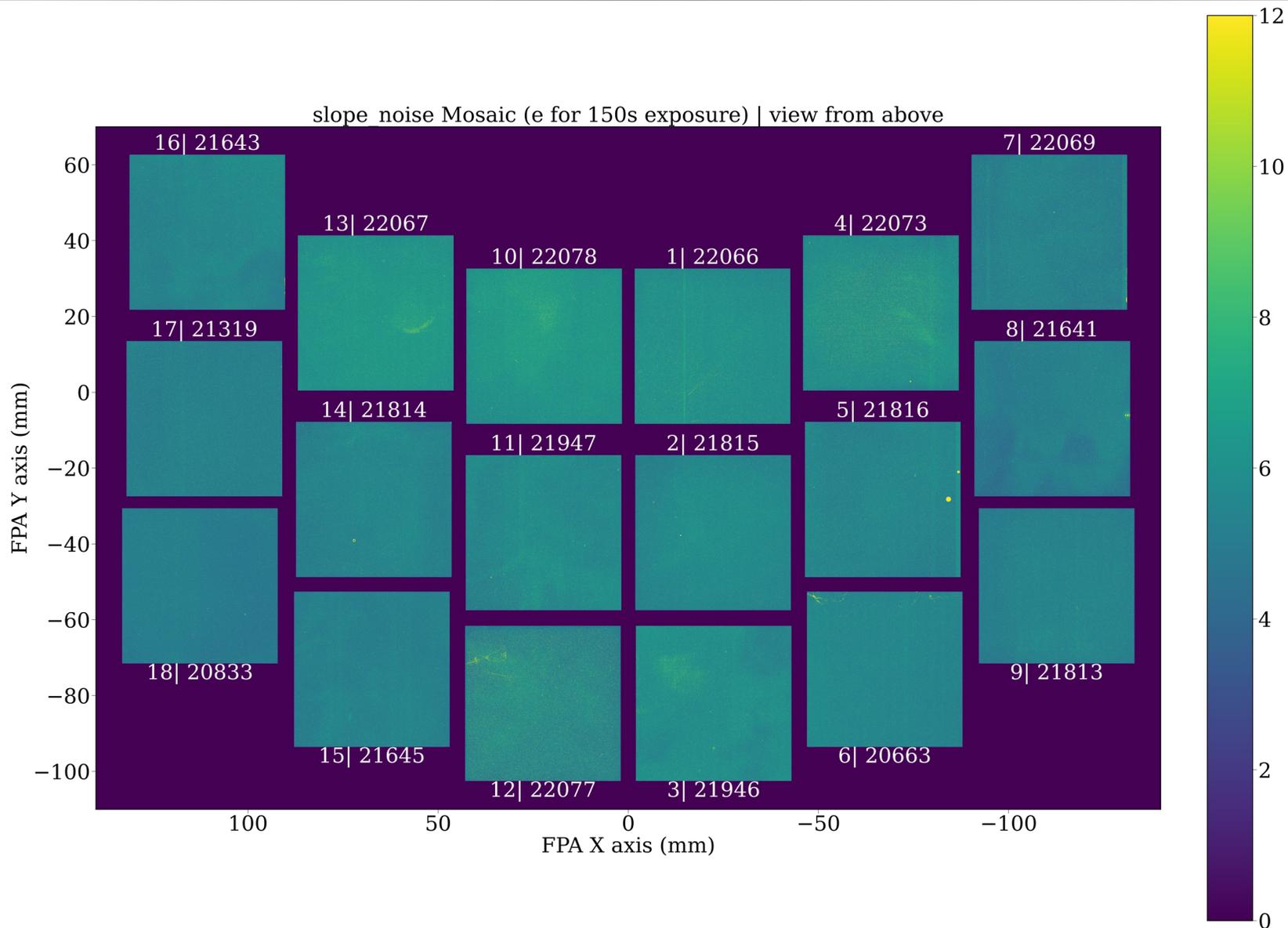


Roman detector compared to cell phone camera

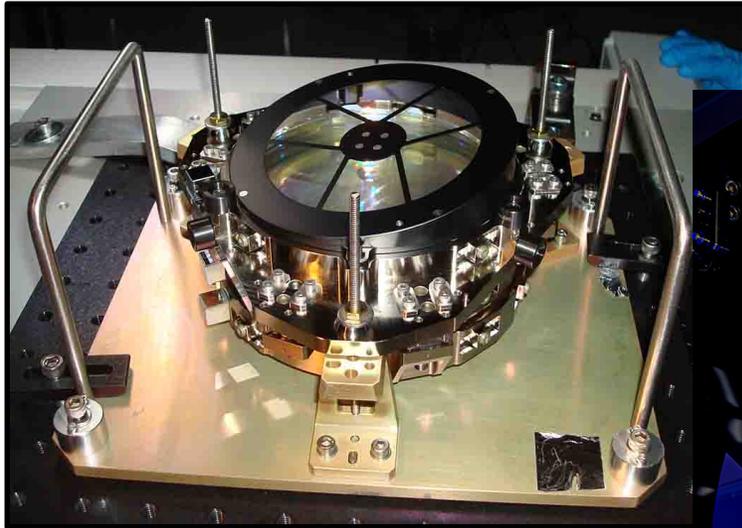


Flight focal plane array

Flight Detectors Exceed Requirements

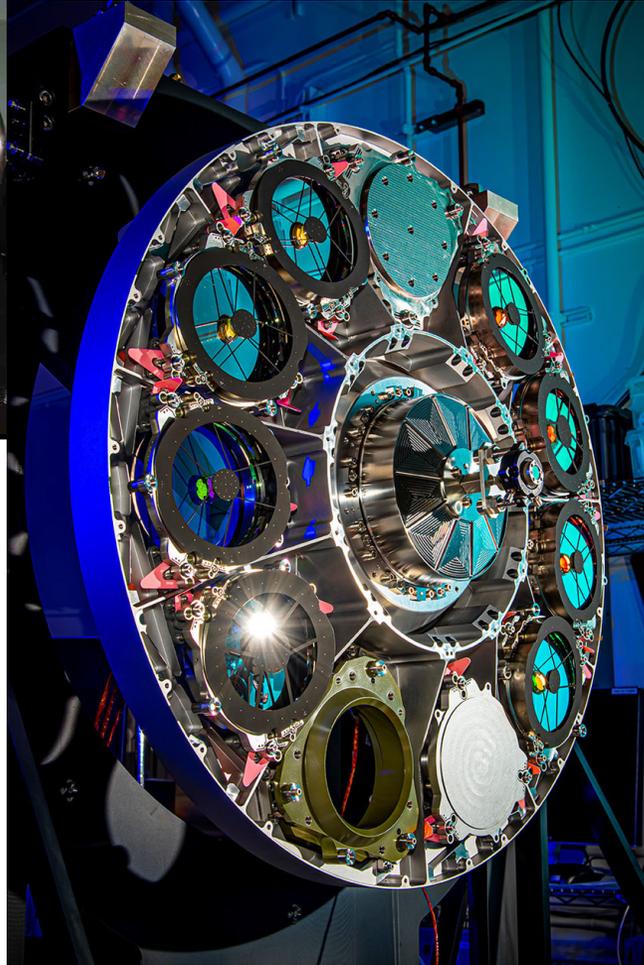


Element Wheel, Filters, Prism, and Grism



Flight Grism assembly

Flight EWA with Filters

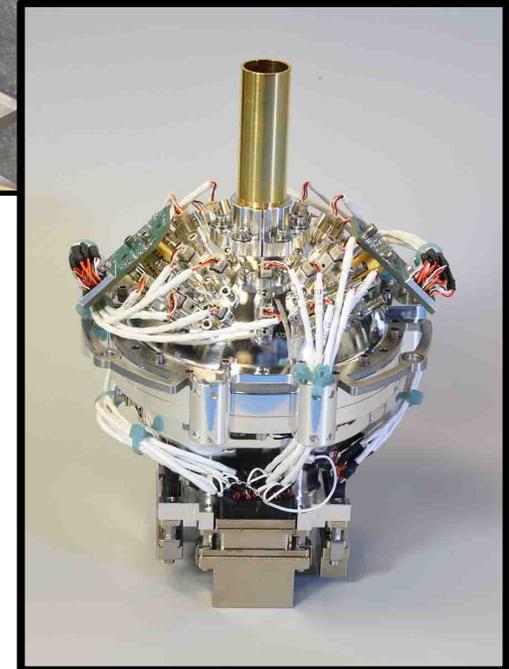


- Flight Element Wheel and drive motor fabricated and undergoing test at Ball Aerospace
- Flight Filters cleared environmental testing and have been installed in the element wheel for assembly level tests
- Flight Prism and Grism assemblies complete and cleared environmental tests at NASA GSFC, optical and spectral characterization complete, currently undergoing integration into Element Wheel

- Flight Optical Bench complete and undergoing test at Ball Aerospace
- Alignment Compensation Mechanism, Cold Baffle, and other key WFI hardware also complete and undergoing assembly integration and test at Ball Aerospace
- Relative Calibration System flight assemblies in integration and test, ETU light source in environmental and thermal vacuum tests



Flight optical bench



Calibration system ETU light source assembly

Roman WFI Status Summary

WFI flight hardware is solidly in the build and test phase and heading toward full instrument integration and test in 2023!

